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TECHNICAL MANUSCRIPT 135

DISEASE HAZARDS IN THE  
MEDICAL RESEARCH LABORATORY

APRIL 1964

UNITED STATES ARMY  
BIOLOGICAL LABORATORIES  
FORT DETRICK

NO OTS

U.S. ARMY BIOLOGICAL LABORATORIES  
Fort Detrick, Frederick, Maryland

TECHNICAL MANUSCRIPT 135

DISEASE HAZARDS IN THE MEDICAL RESEARCH LABORATORY

Arnold G. Wedum

Industrial Health and Safety Division  
DIRECTOR OF INDUSTRIAL HEALTH AND SAFETY

Project 1C622401A072

April 1964

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ABSTRACT

Disease hazards in the medical research laboratory are principally infectious hazards. The infections are difficult to recognize and control. Although reliable statistics are lacking, available data indicate that the loss of work days and the number of deaths warrant improved reporting, more epidemiological attention, and judicious use of known control measures.

# DISEASE HAZARDS IN THE MEDICAL RESEARCH LABORATORY

Disease hazards in the medical research laboratory are principally infectious hazards. These are difficult to combat compared with chemical, radiological, mechanical, electrical, and fire hazards. The reasons are:

(a) The disease is more difficult to detect and to assign as occupationally acquired;

(b) Even if the disease is determined to be occupational, only in 16 to 35 per cent of the cases can any definite act or accident be cited as the means of infection;

(c) Knowledgeable, differential, evaluated information, rules, regulations, codes, and standards, relative to the research hazards and the preventive measures, often are not available;

(d) A systematic "job analysis" of the project relative to safety often is not a conscious part of the research plan;

(e) Medical personnel as a rule tend to be more reluctant than, for instance, engineers or chemists to enter into a professionally planned safety program that involves critical scrutiny of the entire research process; and

(f) There still exists a significant tradition of self sacrifice, according to which the person in medical research is expected to be willing to contract the disease he is studying, particularly if the disease usually is mild and infection confers an appreciable immunity to reinfection.

As a consequence of the combined effect of these influences there is an absence of reliable statistics on the incidence, or on the total number of cases, of occupationally acquired disease in medical research laboratories. Yet even in the absence of reliable statistics, the existent data make it clear that the matter merits attention. Very important in this connection is the fact that many cases of laboratory-acquired illness remain undiagnosed as such because they are not looked for systematically. Of course, there are reasons for this also:

First, except for those relatively few situations in which the laboratory is studying a disease with an unmistakable disease syndrome, there may be 10, 20, or more episodes of non-occupationally incurred illness indistinguishable clinically from the potential specific occupational illness, and differentiable only by laboratory studies, before one definite case of occupational illness is found. In other words, the cost of identification is high. It must be justifiable if it is to be done routinely as part of a medical program.



Second, facilities for diagnosis and treatment may not be readily available.

Third, for a variety of psychological reasons, both the employee and his supervisor may be reluctant to investigate the illness as possibly occupationally incurred if it is to be reported as a "disabling injury."

Fourth, an employee may not cooperate in the diagnostic program if it involves observation in a hospital when hospitalization causes loss of sick leave or annual leave or its equivalent, or loss of pay, or financial costs, part or all of which could be avoided if he stayed at home during the illness or managed to continue at work.

Now, letting these diseases remain undiagnosed is not always desirable. There are some diseases in which there is serious danger to the patient or to the health of the community, in which early observational hospitalization is important. In other diseases this is unimportant or will vary with circumstances. But in either instance, I believe that discretionary authority should be given at an appropriate supervisory level for selected diseases and/or for designated research laboratories, to permit free hospitalization without loss of sick or annual leave, even if the diagnosis eventually is that of non-occupational illness. Otherwise, in our experience, the employee will tend to avoid hospitalization to his own and our detriment. It also is our experience that employees in a research laboratory do not abuse the privilege of free prophylactic hospitalization for an illness declared by an outpatient physician to be presumptively occupational.

Data on the number of laboratory-acquired infections are being collected by a permanent committee of the American Public Health Association, to which I recommend reports be sent. But it is my impression that these cases often are not reported through any safety channels and thereby are not reflected in the accident statistics of the National Safety Council and the Bureau of Labor Statistics. The tendency is to regard these cases as medical records, not as accident records. One reason, associated with the usual absence of any known causative act or accident, is that the "date of injury" is unknown. Our practice is to report this as the date on which the medical diagnosis is established by the attending physician, which may be after the patient has left the hospital, but the date of hospital admission or initial absence from work could be used. I am unaware of a uniform standard in this matter.

When available statistical data are examined, the disabling injury rate per million man-hours worked, caused by occupational disease, may have wide annual variations even in the same institution. This is caused by changes in the research program, emphasis upon safety, and the effectiveness of prophylactic vaccination. A major obstacle to critical comparison of figures from different laboratories is that there are no uniform standards for collection of data. For instance,

(a) Is the sampled population limited to laboratory personnel or are supervisory, maintenance, clerical, and custodial personnel included if they have access to the laboratory, or is the base population even broader in its scope?

(b) Are only lost-time illnesses included or are subclinical and mild cases to be included? The latter are just as important as the hospitalized cases in directing attention to a failure in safe technique.

(c) Inasmuch as research personnel are notoriously erratic in their hours of work, how many man-hours are to be used per week or year?

(d) Military personnel present a problem because their records are kept as man-days.

Table I presents data illustrative of these variations. For instance, in our own laboratories during 1943 through 1945 when the microbiological safety program was in its infancy the disease rates were very high, up to 143 cases per million man-hours in one large laboratory and up to 35 for all laboratory personnel. Ten years later, after an intensive safety effort, these rates had come down from 143 to 6 and from 35 to 9. By 1960 through 1962, further improvements in equipment, and major advances in the development of vaccines, had reduced the rate from nine to two cases per million man-hours. However, in the absence of effective vaccination, even the best possible safety equipment will not prevent human error from causing self-infection.

Fatality rates for laboratory infections, as collected in various summaries, range from 1.6 to 7.5 per cent, with an average of about four deaths per 100 cases. These figures include cases from all laboratories, including diagnostic laboratories, that handle material infectious for man. These rates are rather high, considering that they are in a relatively small, highly trained group, and considering that the fatality rate for all disabling injuries in the United States for 1962 was one per cent, and the fatality rate for motor vehicle accidents in 1962 was 2.7 per cent, as reported by the National Safety Council.

In conclusion, to reduce the incapacitation and death from occupationally acquired disease among personnel of medical research laboratories I recommend action to:

(a) Evaluate hazards in medical research and prepare corresponding tested countermeasures.

(b) Provide consultation services and dissemination of evaluated information.

(c) Prepare standards for reporting of cases.

(d) Encourage early diagnosis and treatment of cases by selective authorization of free hospitalization for suspected occupational disease without loss of pay, and without charge to sick leave or vacation time.

TABLE I. DISABLING OCCUPATIONAL DISEASE IN MEDICAL RESEARCH LABORATORIES

Laboratory	Cases Per Million Man-Hours
U.S. Army Biological Laboratories	
Process Research Laboratory only, Agent 1, 1943-1945	143.00
Process Research Laboratory only, Agent 1, 1953-1955	6.40
All Laboratory-Admitted Personnel, 1943-1945	35.00
All Laboratory-Admitted Civilians, 1954-1958	9.10
The Same, Including Non-Lost-Time Infections	11.87
All Laboratory-Admitted Civilians, 1960-1962	2.01
A Large European Laboratory, 1944-1959	50.00
Tuberculosis Laboratory Technicians, Canada 1947-1954	19.00
Medical Research Institutes	4.01
National Institutes of Health, 1954-1960 <sup>a/</sup>	3.41
Public Health Laboratories <sup>b/</sup>	0.35

a. Includes unconfirmed cases.

b. Primarily diagnostic, not research, laboratories.